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BEAR SWAMP WATERSHED

FINAL ENVIRONMENTAL IMPACT STATEMENT

Chowan and Perquimans Counties

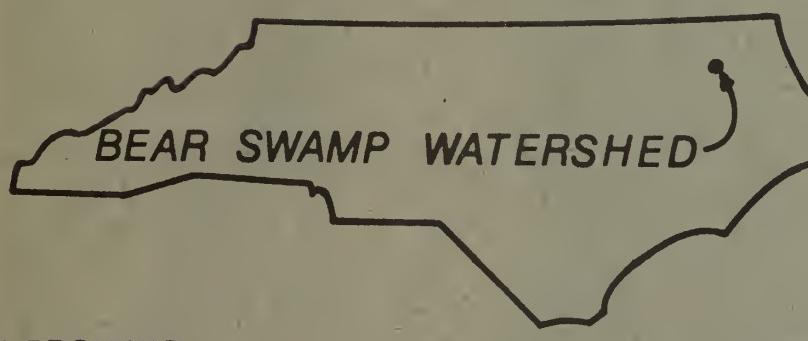
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Bear Swamp Watershed
Chowan and Perquimans Counties, North Carolina

Final Environmental Impact Statement

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Prepared By

United States Department of Agriculture
Soil Conservation Service
Raleigh, North Carolina 27611

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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT

for

Bear Swamp Watershed
Chowan and Perquimans Counties, North Carolina

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USDA ENVIRONMENTAL IMPACT STATEMENT

Bear Swamp Watershed
Chowan and Perquimans Counties, North Carolina

Prepared in Accordance with
Sec. 102(2) (C) of Public Law 91-190

SUMMARY SHEET

I Final (X)

II Soil Conservation Service

III Administrative (X)

- IV Brief Description of Action: A watershed project to be carried out by the sponsoring local organizations with federal assistance under authority of Public Law 566. The project, located in Chowan and Perquimans Counties, North Carolina, proposes conservation land treatment over the watershed, supplemented by 17.3 miles of stream channel work and one grade control structure. The channel work consists of excavation on 0.2 miles of unmodified channel (N), 1.3 miles of new channel construction (O) and 15.8 miles of previously modified channel (M). The flow conditions of these streams prior to the project were 3.3 miles with perennial flow (Pr), 8.2 miles with intermittent flow (I) and 5.8 miles with ephemeral flow (E). The channel work will provide improved water management in a watershed that is 42 percent agriculture crop and pasture land and 57 percent forestland.
- V Summary of Environmental Impacts and Adverse Environmental Effects: Reduce sediments entering channels from 2,600 tons per year to 1,670 tons per year; provide drainage outlets for 7,430 acres; reduce the degree and duration of floods, thereby providing a 54 percent reduction in damages to crop and pasture land, and improving transportation routes; improve health conditions by improved septic drain fields and elimination of mosquito breeding habitat; increase the income and improve employment opportunities in the watershed; disruption of habitat between Secondary Road 1113 and Lateral 5; temporary damage to fishing resources during and immediately after construction; approximately 62 acres of forestland converted to spoil placement and additional channel widths; thirty-one acres will be temporarily cleared for debris disposal.

- VI Alternatives Considered: Land treatment only; channel work and floodwater storage; flood insurance with flood plain zoning; and no project.
- VII Agencies and Others from Which Written Comments are Requested: United States Department of the Army, Corps of Engineers; United States Department of Commerce; United States Department of Health, Education, and Welfare; United States Department of the Interior; United States Department of Transportation; Environmental Protection Agency; Federal Power Commission; Advisory Council on Historic Preservation; North Carolina Department of Natural and Economic Resources (for the Governor); North Carolina Department of Administration, State Planning Division (State Clearinghouse); and other interested parties.
- VIII The Draft Environmental Statement was transmitted to CEQ on July 11, 1975.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT

for
Bear Swamp Watershed
Chowan and Perquimans Counties, North Carolina

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83rd Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Albemarle Soil and Water Conservation District
and
Chowan County Drainage District No. 3

PROJECT OBJECTIVES AND PURPOSES

A preliminary investigation of the watershed area was made by the Soil Conservation Service at the request of the sponsoring local organizations. Upon completion of this investigation, the findings were discussed by the sponsoring local organizations and the Soil Conservation Service, and after the problems and potential solutions were discussed, project objectives were formulated. The sponsors set forth the primary objectives of watershed protection, flood prevention, and fishery resource development.

The local sponsors desire to establish a complete soil and water conservation program on the watershed. Some specific objectives were:

1. Develop soil and water conservation plans on 85 percent of the farms in the watershed.
2. Have adequate treatment on not less than 50 percent of the open land in the watershed.
3. Improve fish habitat in the streams.
4. Reduce flood damage sufficiently to continue current land uses.
5. Provide suitable outlets for internal drainage of open land.

Objectives and Purposes

The sponsors considered the impacts, both favorable and adverse, in developing the plan for meeting stated and other objectives. The overall project objective is the conservation, development, and productive use of the watershed's soil, water, and related resources in such a way that the residents of the watershed can enjoy:

QUALITY IN THE NATURAL RESOURCE BASE FOR SUSTAINED USE.

QUALITY IN THE ENVIRONMENT TO PROVIDE ATTRACTIVE, CONVENIENT, AND SATISFYING PLACES TO LIVE, WORK, AND PLAY.

QUALITY IN THE STANDARD OF LIVING BASED ON COMMUNITY IMPROVEMENT AND ADEQUATE INCOME.

The sponsors selected and/or modified measures which will help to achieve these objectives and also to minimize adverse impacts wherever possible and still accomplish the project objectives.

PLANNED PROJECT1/

Land Treatment

Land treatment measures included in this plan were considered as the basic element in project formulation. They are necessary and justified to properly conserve, develop, and improve the agricultural land, and to assure the benefits used in justification of structural measures. Vegetative measures to be installed will consist of conservation cropping systems, cover crops, crop residue, minimum tillage and grasses and legumes in rotation. Mechanical measures will consist mainly of tile and drainage mains and laterals.

Land treatment measures will be planned and applied in cooperation with the Albemarle Soil and Water Conservation District. Technical assistance for planning and installing of land treatment measures will be provided by the Soil Conservation Service through the soil and water conservation district and the U.S. Forest Service in cooperation with and through the North Carolina Forest Service.

Approximately 950 acres of soil surveys, requiring 4 man-days of survey time, will be needed during the project installation period.

There will be 1,376 acres of cropland and 30 acres of grassland adequately treated during the project installation period. Complete soil and water conservation plans will be prepared on 10 farms and six existing plans will be revised. The typical measures to be installed in order to achieve treatment are defined as follows:

1. Conservation Cropping System: This system involves growing crops in combination with needed cultural and management measures. Cropping systems include rotations containing grasses and legumes as well as rotations achieving desired benefits without using such crops. This measure will improve or maintain good physical condition of the soil; protect the soil during periods when erosion usually occurs; help control weeds, insects, and diseases; and provide an economic return for farmers.
2. Crop Residue Use: By using plant residues in the plowing of leaves, stalks, and other plant remains back into the soil after the crop has been harvested, this measure improves growing conditions in the soil.

1/ All information and data, except as otherwise noted by numbered reference to bibliographical source, were collected during watershed planning investigation by the Soil Conservation Service and Forest Service, United States Department of Agriculture.

Planned Project

3. Minimum Tillage: This measure means limiting the number of cultural operations to those that are properly timed and essential to produce a crop and prevent soil damage. These limits retard deterioration of soil structure, reduce soil compaction and formation of tillage pans to improve soil aeration, permeability, and tilth.
4. Field Border: With this measure a border or strip of perennial vegetation is established at the edge of a field by planting or by conversion from trees to herbaceous vegetation or shrubs. Purposes of a field border are to control erosion, protect edges of fields that are used as "turn rows" or travel lanes for farm machinery, reduce competition from adjacent woodland, provide wildlife food and cover, and improve the landscape.
5. Pasture and Hayland Planting: Such planting means establishing and reestablishing long-term stands or adapted species of perennial, biennial, or reseeding forage plants. (Includes pasture and hayland renovation but does not include grassed waterway or outlet on cropland.) The purpose of this measure is to reduce erosion, produce high quality forage and to adjust land use.
6. Drainage Mains and Laterals: These consist of graded ditches installed to collect excess water within a field, lower the water table on areas having drainage problems, to serve as outlets for subsurface drains and to convey floodwater from the fields.
7. Land Smoothing: Land irregularities are removed with special equipment. Land smoothing improves surface drainage, provides for more effective use of precipitation, obtains uniform planting depths, provides for more uniform cultivation, improves equipment operation and efficiency, improves terrace alignment, and facilitates contour cultivation.

The Soil Conservation Service has predicted that 3,740 acres of cropland will receive partial conservation treatment. This will be in addition to the acres of crop and pasture land described above which will receive adequate treatment. Partially treated land has had one or more conservation measures applied to it, but it still needs other measures to be fully and adequately treated.

The following land treatment program on forestland was developed from a program of land treatment needs prepared by the United States Forest Service in cooperation with the North Carolina Division of Forest Resources, after a field survey of the watershed, and from land use recommendations by the Soil Conservation Service:

a. Tree Planting and Site Preparation (300 acres)

Reforestation of appropriate open land and understocked stands is necessary to bring this land into full production and return the fullest benefit to the landowners.

b. Forest Management (1,200 acres)

In order to realize the maximum benefits to the forestland, it is necessary to put it under proper management. These management practices include intermediate and harvest cuttings, site preparation, and regeneration.

Structural Measures

Structural works of improvement consists of approximately 17.3 miles of stream channel work and one grade control structure for flood prevention and drainage.

The planned channels will be constructed primarily in poorly graded sands (SP) and silty sands (SM), which contain enough clayey material to act as similar. A representative profile shows 1.5-2.0 feet of a black SM (topsoil) overlying a dark gray SP-SM material. The SP-SM material in all holes is tight and compact in its undisturbed state. Some thin horizons (two to four inches thick) of clay (CL) were encountered within the SP-SM material. Based on an evaluation of the field performance of existing channels and the soils correlation data, it is concluded that there will be no major problems with bank or bottom stability as a result of the project.

Project channels are designed to remove runoff from cropland from all storms up to the five-year, 24-hour frequency storm within a period not to exceed 24 hours. It is possible that lands adjacent to the channel may still experience some flooding from storms of the five-year, 24-hour magnitude or less but removal of all floodwaters from this and smaller storms within the 24-hour period will prevent any damages to crops and pasture. Large infrequent storms will still cause some damage even with the improved channels but the decreased depth and duration of flooding from these storms will result in damages significantly less than under existing conditions. The depth of channels will be such that an adequate outlet will be assured for existing and future on-farm drainage systems.

A grade control structure will be required on Lateral 5 to flatten the gradient and insure a stable channel. Sand-cement bag riprap will be used to protect and stabilize the structure. Pipe inlets are planned to be installed, as needed, to allow surface water to enter the channels without serious erosion and to provide a travelway for maintenance. The travelway will not be continuous; however, access to all segments will be available

Planned Project

from public roads. Small field ditches entering on the spoil side may require pipe inlets. These inlets are planned to be installed as part of the project system. Spur ditches will be used for most ditches on the side opposite the spoil. Bituminized fiber or corrugated metal pipe is planned for the small pipe inlets except at public roads. Corrugated metal pipe is required for public roads to meet the North Carolina Department of Transportation and Highway Safety specifications.

New construction will follow existing channels. Spoil will be placed along both sides of the channel on the main downstream from Lateral 2, and on one side of the remaining channels. Special consideration will be given to occasionally leaving mast producing trees in the area to be cleared on the main channel below Lateral 2. The Service biologist and engineer will cruise this area prior to construction to mark trees to be left. These trees will be located on the proposed channel bank at a minimum frequency of one per 200-400 feet and spoil will be placed so as not to interfere with their future growth. In addition, a 20 feet section of native vegetation will be left on one side of the main channel both above and below each road crossing. These strips will be selected to give the maximum screening effect without interfering with water flow. Debris cleared from the construction area between Lateral 5 and the lower crossing of Secondary Road 1113 will be removed from the swamp to avoid destruction of prime wetland habitat.

The spoil adjacent to all channels will be shaped and seeded. Portions of the shaped spoil will serve as a maintenance travelway where the channel passes through forestland. The shaped spoil from laterals passing through cropland will be used as "buffer" strips or sediment filters as well as travelways. Filter strips, 15 feet wide, will be established on the side opposite the construction on these laterals to reduce sediment entering channels. Vegetation will also be established along the top of all channel banks and will consist of adapted trees, shrubs, grasses or legumes selected according to: characteristics of the particular site, maintenance requirements, wildlife benefits, and effectiveness in protecting channels and reducing maintenance costs. In addition to the vegetation established on the buffer strip and along the top of the channel banks, a three-foot strip of shrub lespedeza and autumn olive will be established along the outside of the buffer strip where used as a travelway through forested areas.

In selecting the plants to be used on the buffer strips and channel banks, consideration will be given to selecting different plantings that will benefit wildlife species whose numbers are subject to seasonal oscillation due to food and cover being limiting factors. Planting of the different species, which will serve as food and cover during the different seasons, will be in alternate strips. For example, plantings for winter mast and stream-side shade will consist of sawtooth oak, pin oak, green ash, and willow oak.

Planned Project

Nine public and six private road crossings will require modification. These modifications include rock riprap, which will be used in lieu of modifying the bridge, to be placed at the upper crossing on Secondary Road 1113. Other modifications required are Secondary Road 1110 crossings at Laterals 4A, 4, 10, and 11; Secondary Road 1101 crossing at Lateral 3A; Secondary Road 1114 crossing at Lateral 2. These roads will be modified by lowering the elevation of existing pipes or by installing larger pipes.

Investigations have disclosed that the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown in the agreement.

Channels are designed with sufficient capacity and depth below Lateral 2 (see project map) to eliminate the need for removal of the vegetation from the banks once it is reestablished. This will eliminate destroying wildlife cover, food, and shade in maintaining the channels.

Every reasonable effort will be made to control sediment production during construction. The major control measures will be: (1) overdigging 100 feet sections to serve as sediment traps immediately below major stream junctions; and (2) temporary seeding of spoil and channel banks as construction progresses upstream.

An archaeological survey was contracted with the North Carolina Department of Cultural Resources, Division of Archives and History (19), as an item of the project. The results of the survey substantiated no known archaeological or historical sites or materials in the project area that might be adversely affected by the proposed channel modification. If any such items are found during construction, the United States Department of the Interior, the North Carolina Department of Cultural Resources, and the Research Laboratories of Anthropology at the University of North Carolina in Chapel Hill will be notified and construction halted until said finds are evaluated.

Land Use Changes

About 93 acres of forestland (not including channel area) will be cleared, of which 54 acres will be converted to spoil placement and a maintenance travelway. Approximately eight acres will be committed to channels due to increased top widths over existing channels. The remaining 31 acres, used for debris disposal, will be allowed to revert naturally to forestlands after construction.

Of the channels in open land, two additional acres will be committed to permanent channels and eight acres converted to spoil placement and travelway.

Planned Project

Maintaining the channels and travelways so that they will continue to provide the planned flood and drainage relief, as well as serving as filter strips through open land, will preclude these areas from other uses in the future.

Operation and Maintenance

Land treatment measures will be maintained by individual landowners under provisions of their soil and water conservation plans. Forestry land treatment measures will be maintained by landowners under agreement with Albemarle Soil and Water Conservation District. The North Carolina Division of Forest Resources will continue to furnish forest management assistance through the present Cooperative Forest Management Program and fire control activities through the present Cooperative Forest Fire Control Program.

The Albemarle Soil and Water Conservation District supervisors will make an annual inspection of the land treatment (including forestry measures) to determine the status of maintenance. A report of their findings and actions taken will be prepared and a copy provided to the Service representative. Special emphasis will be placed on areas that are found to be in need of additional protection.

Structural measures to be maintained consist of 17.3 miles of stream channel work and one grade control structure. Maintenance will be performed by Chowan County Drainage District No. 3. The district will make assessment on the benefited land to provide funds for carrying out maintenance. The cost of maintenance is estimated to be \$10,500 annually.

Maintenance of stream channel work will consist of, but not be limited to, the following:

1. Removal of debris from channels following major storms.
2. Control of undesirable growth in and adjacent to channels.
3. Control of aquatic plants in channel bottoms.
4. Removal of sediment from sediment traps.
5. Repair or replacement of pipes and bridges.
6. Management of vegetation on rights-of-way.
7. Removal of debris from pipes through spoil.

The Service and the sponsors will make a joint inspection annually, or after unusually severe storms.

Specific agreements for the maintenance of structural works of improvement will be executed prior to the issuance of invitations to bid. This agreement will cover such items as source of funds, method of providing maintenance, annual maintenance inspections, and the responsibility for providing these funds and service.

Project Costs

Shares of the total project cost of \$714,000 are shown in the following table:

<u>PROJECT COST SHARING</u>			
<u>Item</u>	<u>Public Law 566 Funds</u>	<u>Other Funds</u>	<u>Total Funds</u>
Land treatment	\$ 19,170	\$ 278,830	\$ 298,000
Structural measures cost	\$ 268,923	\$ 147,077	\$ 416,000
Total	\$ 288,093	\$ 425,907	\$ 714,000

Structural measures cost includes the total construction cost of \$262,000. Of this amount \$200,823 will be paid by Public Law 566 funds and \$61,177 by other funds.

ENVIRONMENTAL SETTING

Physical Resources

Bear Swamp is located in the northeastern part of North Carolina. It covers an area of 20,300 acres, of which one-third is in Chowan County and two-thirds in Perquimans County. The center of the watershed is 10 miles north of Edenton (population 4,766) and five miles northwest of Hertford (population 2,023) (1). It is fan-shaped, the larger area being in the headwaters. The main stream (Goodwin Creek) flows north for about two-thirds its length, then flows east to its confluence with the Perquimans River.

The watershed is in the Roanoke subregion (0301) of the South Atlantic Gulf Water Resource Region (see Figure 1), as delineated by the Water Resources Council (2). This subregion, located in northern North Carolina and southern Virginia, extends from the mountains to the coast. Bear Swamp (Goodwin Creek) empties into Perquimans River approximately 20 miles upstream from Albemarle Sound. The physical features of the watershed are characteristic of the flat, lower coastal plain of the Roanoke subregion area which contains fertile farmland dependent upon adequate drainage. Elevations within the watershed vary from about 20 feet mean sea level in the headwaters to nearly sea level at the confluence with Perquimans River. Most of the land is nearly level. The headwaters area features a large forested area with poorly developed drainageways.

The average annual rainfall is about 49 inches and is well distributed throughout the year. Temperatures vary from an average high of 79 degrees Fahrenheit in July to an average low of 43 degrees Fahrenheit in January.



**LOCATION OF THE WATERSHED
WITHIN THE ROANOKE SUBREGION OF
THE SOUTH ATLANTIC GULF WATER
RESOURCE REGION**

Figure 1
10

Environmental Setting

An average growing season is 225 days, extending from the first of April to the middle of November.

According to Ground Water Bulletin Number 10, published by the North Carolina Department of Water Resources, ground water containing less than 50 ppm of chloride is available from the water table and the upper Yorktown aquifer throughout most of Perquimans County (3). Objectionable amounts of other compounds causing "hard" water are present, however, and treatment is required before use.

Very little use is made of the surface water of the area. A small amount is used for livestock. Due to natural drainage sources in the swamp areas, the waters are usually low in dissolved oxygen and have a low pH. There are no major point-sources of pollution discharge and those pollutants associated with agricultural run-off, are the only man-made detriments to water quality. The extent of the agriculturally related pollution has not been documented. The stream is classified by the North Carolina Office of Water and Air Resources as "C" suitable for fishing and fish propagation and other usage requiring waters of lower quality (4). Of the 17.3 miles of channel to be modified in the project, 3.3 miles are classified as having perennial flow, 8.2 miles as having intermittent flow, and 5.8 miles as having ephemeral flow.

Water samples taken at two stations in the watershed, though not representative, may provide some general idea of the conditions of the stream waters in the spring of 1974:

Substance Measured Station	Test Results	
	SR 1117	SR 1313
Alkalinity, Total (Mg/l)	30	20
Apparent color (units)	100	210
Hardness, Calcium (Mg/l)	30	30
Nitrogen, Nitrate (Mg/l)	0.3	0.25
Nitrogen, Nitrite (Mg/l)	0.0	0.0
Dissolved Oxygen (Mg/l)	9	9
pH	6.4	6.3
Phosphate, Total (Mg/l)	0.1	0.11
Turbidity (Jtu)	2	5

These samples were taken and analyzed by a Soil Conservation Service biologist using a Hach model DR-EL Water Chemistry Kit.

Most of the soils in the watershed are classified in the Portsmouth, Hyde, Bladen, and Wahee series. Small areas on the ridges and adjacent to the more efficient drainage ways are in the Altavista and Conetoe series.

Environmental Setting

These soils have been described and classified into certain capability groups. Capability grouping shows, in a general way, the suitability of soils for particular uses, the risk of damages or losses involved in their use, and the way they respond to treatment. For example, subclass 1lw indicates the soils have moderate limitations reducing the choice of plants because of wetness; subclass 1llw indicates severe limitations because of wetness; and subclass 1ls indicates a moderate limitation because of a shallow, droughty or stony soil.

Portsmouth and Hyde soils have black loamy surface horizons with gray loamy subsoils and are very poorly drained. Most of these soils are in land capability subclass 1lw.

Altavista soils have fine loamy surface horizons and loamy subsoils. They are moderately well-drained and in capability subclass 1lw. Conetoe soils have a thick sandy surface layer with a loamy subsoil. They are somewhat excessively drained and in the capability subclass of 1ls.

The land capability class, as mentioned above, groups soils according to limitations for agricultural use as indicated by the subclass and the reasons for these limitations.

There are 8,342 acres of cropland, 130 acres of pastureland, 203 acres in idle or miscellaneous uses, and 11,625 acres in forestland. Practically all land except for public roads is in private ownership. There have been about 7,125 acres of the forestland cleared of hardwood species.

All channels in the watershed on which work is proposed have been previously modified with the exception of (see Table 3 and project map); (A) the upper portion of Lateral 4 and the lower portion of Lateral 5 which presently have no well-defined channel, (B) the lower portion of Lateral 4A which now has an unmodified, well-defined channel.

Cover conditions of the watershed are good. Open lands are well managed with crop residue fully utilized. Forestlands have an excellent layer of humus which is effective in retarding runoff and controlling erosion.

The population of the watershed is estimated to be approximately 800. All of the population is classified as rural with a small number being non-farm. There has been a great decline in farm population over the past 15 years. The publication, Profile of North Carolina Counties, shows that the area suffered a net outmigration of about four percent in 1967 alone (5). This is further indicated by the abandoned homes and farm buildings found throughout the watershed.

Plant and Animal Resources (Flora and Fauna)

The 7,125 acres of forestland that have cleared of the mixed stands of pine and hardwood species, largely in commercial or corporate ownership, are

being converted chiefly to pine by site preparation work and tree planting. Small individually owned forest tracts will probably remain in wetland forest type. Principal species include loblolly pine, pond pine, water oak, red oak, sweetgum, black gum, hackberry, and beech.

Most of the cropland is in one large area from the headwaters of existing channels down to Lateral 5. In the upper reaches of this area (down to the junction of Lateral 2 and the main), crops are planted up to the channel banks, thereby eliminating most native vegetation. Cropland below Lateral 5 is in smaller tracts interspersed with tracts of forestland. The vegetated edge begins on the main at Lateral 2 and gradually widens to 600-800 feet at Lateral 5.

There are approximately 350 acres of Types 1 and 7 (6) wetlands between Secondary Road 1113 (lower crossing) and Secondary Road 1111 (see project map). Additional areas of wooded swamps and seasonally flooded bottom lands extend on to the Perquimans River. In the vicinity of Secondary Road 1111 and below, wetland habitat is comprised mainly of cypress with a few tupelo gum and ash present. Going upstream the number of cypress becomes fewer with numbers of tupelo gum, ash, and oak increasing. Upstream from Lateral 5, ash and sycamore become the dominant tree species. The wet bottom lands provide habitat for waterfowl and escape areas for deer.

The uplands and agricultural lands adjacent to the stream in the upper portions of the watershed support populations of deer, small game, fur-bearing animals, and occasional waterfowl where farming practices have not eliminated cover.

Fishery resources in the lower reaches of Bear Swamp (Goodwin Creek) below Lateral 5 are considered good. The North Carolina Wildlife Resources Commission has classified the lower portion of the stream as largemouth bass and has reported that the stream provides "very good fishing for flier, warmouth, bluegill, and chain pickerel." Fish food organisms are plentiful as a sample taken revealed an average volume of $1.2 \text{ ml}/\text{ft}^2$ and an average number of $242/\text{ft}^2$.

The upper reaches of Bear Swamp are classified as redfin-warmouth by the North Carolina Wildlife Resources Commission (7). However, the upper half of the main channel (above Secondary Road 1110) and the tributary channels have insufficient base flow to support fish throughout the year. Portions of the channel between Secondary Road 1110 and Lateral 5 are sometimes used for herring spawning in the spring. The fishery resources in the previously channelized sections in the upper end of the stream and in the small tributaries are generally of low value. All channel work proposed in this project is on channels that have been previously modified or where there is now no existing channel with the exception of the lower end of Lateral 4A (see project map). Although this lateral is a natural unmodified channel it also has little or no fishery resource.

Environmental Setting

Economic Resources

The 130 farms in the watershed, varying in size from a few acres to several hundred acres, average 115 acres. The majority are family-type farms; however, a few of the larger farms employ full-time hired labor. The average value per farm including buildings is approximately \$65,000. Crop and pasture land is valued at \$700 per acre while swamp forestland is valued at \$100 per acre. About 30 percent of the forestland is in several large tracts owned by timber companies and devoted to commercial timber production.

Land value and size of farms more than doubled in this area from 1954 to 1964, based on data contained in the United States Census of Agriculture (8). During the period 1964-1969 land values increased another 50 percent while the size of farms increased by 10 percent. The trend to larger operating units is expected to continue. About 60 percent of all farms in the watershed and about 45 percent of all commercial farms produced products with a gross value of less than \$10,000.

The major crops grown in the watershed are soybeans, peanuts, and corn. These crops account for approximately 80 percent of gross farm income. Present yields of these crops are: soybeans - 27 bu/ac; corn - 75 bu/ac; and peanuts - 2,300 lb/ac. Vegetable crops such as Irish potatoes and sweet corn are of minor importance; however, the acreage in these crops is expected to increase. Swine production is rapidly increasing in importance as indicated by the fact that sales have more than doubled since 1954. Farmers have found swine production to be a valuable means of increasing farm income.

Chowan and Perquimans Counties are in the Coastal Plain Regional Development Area, as designated under the Economic Development Act of 1965. This area is one of chronic unemployment and underemployment.

There are no railroads, United States highways, or North Carolina primary highways in the watershed. However, the watershed is served by a good network of secondary roads. They provide adequate access to markets.

There are no towns of 20,000+ population within 20 miles of the watershed. Edenton, a town of approximately 5,000 located 10 miles south, and Hertford, a town of approximately 2,000 located five miles southeast, serve the majority of the needs of the local people.

Recreational Resources

There are no organized recreational facilities within the watershed.

Environmental Setting

Fishing is generally limited to cane pole fishing at public roads where easy access can be obtained. Good fishing seems to be available but there are few points where boats can be launched so that fishing waters can be reached.

Waterfowl habitat is limited to the lower portion of the watershed and there is no significant hunting in this area. Deer hunting is limited almost entirely to the 1,000 acres of forestland which is leased to a private hunting club.

Archaeological and Historic Resources

According to the National Register of Historic Places, there are no known places of historic value within the watershed (9). The North Carolina Department of Cultural Resources, Division of Archives and History, and the Research Laboratories of Anthropology at the University of North Carolina in Chapel Hill have no record of any places of historical or archaeological value or unique scenic areas being located in this area. The town of Edenton, located 10 miles south of the watershed, has several preserved houses built during the late 18th and early 19th centuries.

Soil, Water, and Plant Management Status

There are no clearly defined trends in change of land use within the watershed. It is expected that some of the present cropland will be put into crops such as vegetables that have a higher net return per acre. The timber companies will likely continue the conversion of their forestland to pines. The size of farms and fields is expected to continue to increase to accommodate the use of larger, more efficient equipment.

Soil and water conservation plans have been prepared for 99 farms, or 76 percent of the farms in the watershed. These plans cover 13,532 acres, or 67 percent of the watershed.

Soil surveys have been completed on about 14,550 acres. An additional 950 acres will need soil surveys during the installation period.

The North Carolina Division of Forest Resources, in cooperation with the United States Forest Service, is providing forest management assistance, forest fire prevention and suppression, distribution of planting stock, and forest pest control assistance to private landowners in the watershed area through the various federal-state cooperative forestry programs. The allowable burn goal set for this area is less than 0.2 percent of the area protected. During the past five years, the burn rate has averaged less than 0.1 percent of the protected area. The programs will be continued throughout the installation period of the project.

Environmental Setting

Some form of open ditch drainage has been installed on most of the 7,004 acres of wet cropland and 130 acres of pastureland in the watershed. A small amount of tile has been installed in the last few years. Drainage is necessary to reduce production costs caused by the need for replanting, extra cultivation, and herbicides for weed control, and increase in harvest costs. Adequate outlets do not presently exist for on-farm drainage.

The Albemarle Soil and Water Conservation District, which covers this watershed, was chartered in 1943. One or more professional employees have been assigned by the Soil Conservation Service to each county since 1944.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

Bear Swamp Watershed presents a problem that is typical of the lower coastal plains in North Carolina. It is located in an area that is intensively row-cropped and the crops respond dramatically to good land management. They also suffer drastically without adequate drainage and protection from flooding.

There is a need to rearrange farm layouts into larger fields to facilitate more efficient use of larger-size equipment being used by farmers. To accomplish this, subsurface drains in combination with open ditches need to be installed to the maximum extent practical. The relatively high annual rainfall necessitates some open ditches in cropland, regardless of the density of subsurface drainage systems. Vegetative measures such as conservation cropping systems, cover crops, and grasses and legumes in rotation are needed to improve and maintain soil productivity. Reforestation of understocked stands and proper forest management are needed to bring forestland into full production.

Floodwater Damages

Damaging floods usually occur in the watershed once or twice each year. Large infrequent floods occur on an average of every 10 to 15 years. An example of this type occurred in 1963 (see Figures 2 and 3). Damage estimates from this flood approached \$300,000. Presently, the flooding and wet conditions affect an estimated 7,004 acres of cropland and 130 acres of pastureland.

Flooding damages crops, pastures, roads, bridges, farm machinery, and farm improvements. It also delays planting, cultivating, and harvesting resulting in increased cost of production. Product quality is reduced further leading to reduced net income. In addition, flooding of roads and bridges results in safety hazards, temporary isolation of farms and inconvenient detours. It often makes schools, markets, and medical facilities inaccessible.

Existing channels cannot remove floodwaters from the cropland fast enough to prevent damages from floodwater originating from the forested areas. Drainage channels constructed in the large forested areas and emptying into existing channels add to water problems on farmland. During periods of excessive rainfall, overland flows from adjacent forestland areas in the upper part of the watershed further increase the flooding problem on crop and pasture lands. However, the swamp and channel below Lateral 5 do have adequate capacity and depth to remove the floodwaters once they reach this point. If the channels upstream from Lateral 5 were improved, the floodwater problems would be greatly reduced.

The larger floods caused pollution problems that cover large areas. Pollution from these floods is a serious health hazard to the nearly 800 people living in the watershed. These floods also endanger water supplies, prevent septic tanks from functioning properly, and produce large concentrations of mosquitoes that are vectors for malaria and encephalitis.

Average annual flood damages are estimated to be \$55,205, including indirect damages.

Erosion Damages

Gross erosion, as measured under present standards, is not a serious problem in the watershed. Cultivated fields are flat and sheet erosion is therefore negligible. Infiltration rates into the sandy soils, found around the western perimeter, are great enough to reduce velocity of runoff water so that it will not transport soil material. Soils in channel banks are largely sandy clay, clayey loam, and silty loam and are stable, with vegetation, under the velocities obtained in the low-gradient channels. Sources and amounts of gross erosion are indicated as follows:

Water and Related Land Resource Problems

<u>Land Subject to Erosion</u>	<u>Acres</u>	<u>Gross Erosion</u>	<u>Annual Total Tons /ac/yr</u>
Cropland and pastureland	8,462	19,300	2.3
Forestland	11,618	3,500	0.3
Other (including roads)	203	430	2.1
Channel banks	17	70	4.1
Total	20,300	23,300	

An average annual erosion rate for the entire watershed would be 1.1 tons/acre/year.

Sediment Damages

There is an estimated 2,600 tons of sediment reaching the main channel and laterals annually. Approximately 1,040 tons (40 percent) of this is deposited in the channels and swamps above Lateral 5 (see project map). This sediment deposition reduces channel capacity, thereby increasing the frequency, depth, and duration of flooding. Below Lateral 5 the sediment has a larger swamp area to spread over. This area traps 1,535 tons of the remaining sediment. Approximately 25 tons per year, consisting of fine suspended particles, leaves Bear Swamp Watershed at an average annual concentration of one mg/l.

Drainage Problems

Soil types and subsurface drainage are the primary problems of water management. There are 7,004 acres of wet cropland and 130 acres of pastureland needing drainage for proper land use efficiency. This drainage includes both surface and subsurface on-farm and group drains. The outlets for these drains are provided by Bear Swamp main and laterals. At the present time efficient systems cannot be installed because of outlets being inadequate.

These problems cause higher production costs by necessitating replanting operations, extra cultivations, extra herbicide and other chemical applications, and greater harvesting costs. The quality of the crop grown on wet soil is usually lower.

Drainage problems associated with the 6,500 acres of forestland within the watershed area are realized at all levels of forest land management from survival of seedlings to harvest and protection. Broadfoot and Williston (8) found that tree regeneration, growth, and survival are adversely affected by prolonged flooding and/or sedimentation.

Management practices such as site preparation, planting, stand improvement work, harvest and protection between harvest rotations are hampered by prolonged flooding. Drainage outlets are needed to allow movement and release of flood-waters, enhance forest land production and also to facilitate access for proper management.



Field of young corn beside State Secondary Road
1312 flooded after a five to six-inch rain, June
1963.



Field of young soybeans flooded after a five to
six-inch rain, June, 1963. (Note crop residue
that floated to the surface and was blown by the
wind to the edge of the field.)

Figure 2



Lateral 1A at State Secondary Road 1312, culvert
and inadequate channel restricts flow.



Public road flooded by June, 1963, rain. Water
is flowing from woodland (left) onto cropland
(right).

Figure 3



Lateral 3 (Sta. 90 + 25) at State Secondary Road 1102 facing downstream.



Main (Sta. 247 + 50) at State Secondary Road 1110 facing upstream.

Water and Related Land Resource Problems

Recreation Problems

Water-based recreation is limited to fishing and waterfowl hunting in the lower forested reaches of the main channel. Poor access and private ownership of the land limits the availability of the existing resources to the general public. The water quality is rated as "C" (see page 11) There is some upland game hunting such as deer and dove in the headwaters of the watershed.

The overall need for additional water-related recreational facilities is lessened because of the watershed's location of approximately 10 miles to access points on the Chowan and Perquimans Rivers and the Albemarle Sound. The sponsoring local organization did not view recreational opportunities as a major problem in the watershed.

Plant and Animal Resource Problems

There are no existing problems which seriously affect the wildlife resources of the watershed. A lack of any existing or long-term management plans for the wildlife habitat and resources is the major threat. Edge habitat has also been reduced or eliminated along the channels through cropland. More wildlife enhancement practices such as the food and cover plantings to be used on the proposed channels would be beneficial.

Low base flow in the summer and fall becomes a limiting factor to fish populations in the upper reaches of the watershed streams.

Water Quality Problems

There is sufficient ground water to meet present and anticipated future domestic and livestock water needs. Except for watering livestock, very little use is made of the surface water. The fresh waters usually contain objectionable amounts of iron and hardness-causing constituents.

Economic and Social Problems

The watershed is in the Coastal Plain Regional Development Area. This area is rated as having chronic unemployment and underemployment. Per capita income in 1970 was approximately \$2,200 and the unemployment rate was 7.1 percent. Approximately 10 percent of the larger farms employ full-time labor; however, the majority of the farms are family-type employing some seasonally hired labor during rush periods.

Minority population of the watershed is estimated to be slightly less than 42 percent shown for Perquimans County in the 1970 Census.



Main (Sta. 256 + 75) at State Secondary Road 1113 facing downstream.



Main near junction with Lateral 5 (Sta. 376 + 50) facing upstream.

ENVIRONMENTAL IMPACTS

Conservation Land Treatment

Land treatment measures on cropland, pastureland, and forestland are essential, along with the planned channel work, to produce the expected benefits. The planned land treatment measures will reduce the rate of runoff and provide onfarm drainage. The proposed forestry land treatment measures will improve the hydrologic condition, reduce sediment, and retard runoff. Good management and continued fire protection will increase the productivity of forestlands.

When complete, the project's proposed installation of tile and open drains will lower the water table in the upper soil profile on approximately 5,450 acres of crop and pasture land. This land will then be better suited for crops because improved drainage permits better soil aeration, better root penetration, and hardier, more vigorous growth. As noted by many researchers, inadequate soil aeration is a primary inhibiting growth factor for plants on excessively-wet soils.

Improved drainage will also decrease direct surface runoff through providing a more deeply drained soil profile with more capacity to absorb rainwater. This decrease in surface runoff will help to reduce the amount of fertilizers and insecticides lost in the runoff, especially those lost from initial impacts of precipitation.

There is expected to be no major change in the amount of gross erosion. As stated under Erosion Damages (page 17) the cropland has an average annual gross erosion rate of 2.3 tons per acre. This is well below the rate where damage would affect future productivity of the cropland. Erosion from channel banks will be reduced by preserving a vegetative strip between channel banks and the cropland.

Structural Measures

The installation of the proposed works of improvement will directly benefit 5,450 acres of crop and pasture land and 800 acres of forestland on which monetary benefits were calculated. There will be 5,700 additional acres of forestland benefited, either directly or indirectly (see project map). It has been estimated that 800 people will be benefited by the proposed structural measures.

The crop and pasture land on which benefits were claimed is subject to flooding from several sources: (1) runoff from pocosins and large forested areas; (2) accumulation of abnormally high precipitation; and (3) overflow from stream channels. The project, as designed, will provide protection from all storms up to the five-year, 24-hour frequency event. Storms of greater magnitude than the five-year frequency will cause some flooding, but the reduction in degree and duration will abate a portion of the flood damages. It has been estimated that the proposed structural measures will yield a 54

Environmental Impacts

percent reduction in damages to crop and pasture. The June 1963 storm would have caused considerably less damage with the proposed project installed. Project channels will remove all runoff water from storms up to a five-year, 24-hour event within a period not to exceed 24 hours. This degree of protection is deemed satisfactory for crops produced in the watershed and will not encourage any significant land use changes.

Effective surface drains can be installed on 5,700 acres of forestland. The improved movement and release of water over these lands will increase seedling survival, tree growth, and access for management. Hardwoods are expected to be retained in the same areas and can be more properly managed under project conditions.

Sediment from channel banks and road ditches is deposited directly into the channels. The filter strips alongside the cropland and pipe inlets will reduce the sediment entering channels from 2,600 tons to 1,670 tons annually. During construction, the sedimentation rate into the channel will be 3,700 tons annually. Sediment traps will create collection points for the coarser particles of sediment to be removed from the channels. These traps are expected to trap 2,030 tons of sediment on an average annual basis during construction and an average of 920 tons annually after the channels have stabilized. Sediment deposited in the swamp area between Lateral 5 and the Perquimans River is estimated to increase on an annual basis from 1,535 tons to 1,660 tons during construction and then decrease to 750 tons after channels have stabilized. The grade control structure will insure a stable channel for Lateral 5.

Health and sanitation conditions will be improved. Pollution from overflow of home sewage disposal facilities will be reduced. Reduction of the danger of polluted domestic water supplies is especially significant. The mosquito population will be reduced by elimination of some breeding places, thereby reducing the danger of malaria and encephalitis.

There is expected to be 400 acres of forestland converted to cropland as a result of the project. No other significant change in land use or crop acreages is anticipated. Local producers do expect improved quality resulting in higher prices and lower production and harvest costs with the adequate drainage.

The flood stage and peak discharge in the reaches below Lateral 5 will be increased slightly after the project is installed. The increase in stage and discharge for the five-year storm will be about .25-foot and 210 cubic feet per second respectively. For the 100-year storm the stage increase would be about .5-foot and the peak discharge would be increased by about 500 cubic feet per second. No project-induced damages will be experienced in these reaches, however, because the wide swamp in the lower part of the watershed provides ample flowage area for any increases in flow.

The wetland habitat of greater value, located in the lower end of the watershed, will not be disturbed. There will be habitat of lower quality located from Lateral 5 upstream to Secondary Road 1110 cleared for channel work.

Environmental Impacts

There will be 93 acres of forestland cleared for additional channel width, spoil placement, and debris disposal. Thirty-one acres in debris disposal areas will revert naturally to forestland in the future.

Debris cleared from the construction area between Lateral 5 and the lower crossing of Secondary Road 1113 will be removed from the swamp to avoid destruction of prime wetland habitat.

There will be some damage to the fishery resources during and immediately after construction. The principal fishery is located below the end of construction; therefore, damage would be from possible temperature increases and the slight increase in sediment during construction. Also spawning areas for anadramous fish could be slightly damaged further upstream to Secondary Road 1110.

The design of the channels will permit native vegetation to return and remain, along with wildlife plantings made during the construction period. This will prevent further disruption of the fishery resources once they have recovered. The filter strips will reduce the possibility of agricultural chemicals from entering the streams.

The project's effect on ground water recharge of the underlying aquifers will be immeasurable since channel work will only deepen existing channels approximately one foot and will only take place in the surface aquifer. A study being conducted by the Agricultural Research Service on the Ahoskie Creek Watershed indicated that after channel modification and several years of monitoring, there is no measurable effect on ground water recharge; the aquifers are continuing to fully recharge every year. In short, the project will drain excess water not used for aquifer recharge (11).

A field survey made under contract with the North Carolina Department of Cultural Resources, Division of Archives and History, showed no sites to be affected by structural measures. If any such sites are discovered during construction work will be halted until an evaluation is made.

Economic and Social

Employment opportunities will be created for the unemployed and underemployed during construction and in the operation and maintenance of the project. This will result in increased economic activity for the area's depressed economy by employing an idle factor of production (labor).

Secondary benefits will accrue as a result of increased income from transporting, processing, and marketing of increased farm production resulting from the project and from supplying additional materials to farmers.

Environmental Impacts

It was estimated that floodwater damages to roads and bridges will be reduced 75 percent with the project installed. With reduced damages, school buses and mail delivery will encounter less delays and detours. More dependable transportation facilities will make medical help, facilities, and markets more accessible to the people of the watershed.

Minority groups make up 26 percent of the landowners owning 5 percent of the land. It is expected therefore that 5 percent of the flood reduction and drainage benefits would accrue to minority groups. Re-development benefits would accrue primarily to minority groups since these benefits are based on the utilization of unemployed and under-employed labor which is higher among these groups. Secondary benefits would accrue to minorities in the same proportion as population make-up or 40 percent.

FAVORABLE ENVIRONMENTAL EFFECTS

- A. Reduce sediment entering channels from 2,600 tons per year to 1,670 tons per year.
- B. Provide drainage outlets for 5,450 acres of cropland and 6,500 acres of forestland.
- C. Reduce the degree and duration of floods, thereby providing a 54 percent reduction in damages to crop and pasture land, and improving transportation routes.
- D. Improve health conditions by improved septic drain fields and elimination of mosquito breeding habitat.
- E. Increase the income and improve employment opportunities in the watershed.

ADVERSE ENVIRONMENTAL EFFECTS

- A. Disruption of habitat between Secondary Road 1113 and Lateral 5.
- B. Temporary damage to fishing resources during and immediately after construction.
- C. Approximately 62 acres of forestland converted to spoil placement and additional channel widths.
- D. Thirty-one acres of forestland will be temporarily cleared for debris disposal.

Environmental Impacts

E. Crop and pasture production will be lost from ten acres of open land which will be committed to spoil and channel.

F. Timber production, forest wildlife habitat, and other forest values will be lost from about 400 acres of forestland which will be converted to cropland.

ALTERNATIVES

Land Treatment Only - Land treatment practices, such as conservation cropping systems, cover crops, and grasses and legumes in rotation, would improve and maintain soil productivity potential for future generations. Erosion is not a serious problem in this watershed.

Benefits from vegetative measures would reduce runoff, increase soil aeration, and provide wildlife food and cover.

Benefits on the 5,450 acres of wet cropland treated during the installation period could not be realized because of inadequate outlets for onfarm surface and subsurface drainage. Only 176 acres could be considered to be adequately treated of the 5,796 acres of the crop and pasture land remaining to be treated.

It is estimated that land treatment will provide flood damage reduction benefits of \$2,990 annually. (See Table 6).

Installation cost of this alternative is estimated to be \$65,000 (\$4,050 average annual) for crop and pasture land.

Channel Work and Floodwater Storage - This alternative includes 11.4 miles of channel work, 8.5 miles of dikes and land treatment as proposed by the planned project. The channel work would be performed on the laterals as proposed in the planned project. Dikes would be used to make temporary (up to 10 days) floodwater storage areas of the forestland (4,400 acres) in the headwaters of Laterals, 2, 2A, 3, 3A, 3B, and 4. (See project and problem location maps.) This would provide flood control on approximately 30 percent of the drainage area of the watershed. The channel work would provide for additional flood control and adequate outlets for onfarm drainage systems.

With this alternative the disruption of wildlife habitat between Secondary Road 1113 and Lateral 5 could be avoided. Temporary damage to the fishery resource during construction would be lessened since no work would be done on the main channel. Favorable environmental effects would be essentially the same as with the planned project. Average annual benefits of this alternative are estimated to be \$55,000.

Alternatives

Adverse effects would include 172 acres of forestland converted to spoil and debris disposal, channel widths, and dikes. Approximately 60 acres of this used for debris disposal would be permitted to revert naturally to forest. Another 4,400 acres of forestland required for the floodwater storage areas would be committed to frequent temporary flooding. There would be some temporary damage to the fishery resource during and immediately after construction of the laterals.

The total cost of this alternative would be \$1,029,000 including land treatment cost of \$298,000 and installation cost of structural measures of \$731,000. In addition, an estimated \$10,000 would be required for annual operation and maintenance. The cost of structural measures plus operation and maintenance is equivalent to an average annual cost of \$55,570 (at 5 7/8 percent).

Flood Insurance with Flood Plain Zoning - This alternative would provide crop insurance for the present cropland, while at the same time zoning the Types 1 and 7 wetlands to insure they would not be cleared in the future. This would leave the watershed in its present state.

At the present time, only one crop in the watershed is considered of high value and insurable through the Federal Crop Insurance Corporation. In Chowan County, 60 percent of the peanuts can be insured under the "all risks" insurance; none in Perquimans County. No other crops are insurable in the watershed, due to the high probability of loss, as determined by the Corporation's Board of Directors. Crop insurance is on a self paying basis, which means premiums must exceed payments by the amount of administrative costs. The high probability of damages occurring frequently makes crop insurance premiums too high to interest the farmers.

No Project - The no-project alternative would be one of present conditions under existing and projected trends. Any adverse effects to existing resources from stream channel work would be eliminated.

It is expected that the problems of flooding and inadequate drainage would progressively worsen on the 7,004 acres of wet cropland and pastureland as channels continued to be filled with sediment, debris, and waterweeds. Needed land treatment practices such as onfarm surface and subsurface drainage systems could not be installed to function efficiently because of inadequate outlets. The farmers would be faced with continuing increasing production costs. The land will revert to a less intensive use as the inefficient factors of production cause the average-annual net returns per acre of corn, soybeans, and peanuts to drop below the net returns from other uses such as trees. Net average annual benefits of \$28,375 would be foregone by leaving the watershed in its existing state.

SHORT-TERM VERSUS LONG-TERM USE OF RESOURCES

Land use in the watershed is primarily small owner-operated farms (115 acres average size). About 30 percent of the 11,625 acres of forestland is in large tracts owned by commercial timber companies.

The trend is to larger operating units through economic necessity. However, present land use, per se, isn't expected to change through the foreseeable future due to the area's limited adaptation to other land uses.

Statements in the 1957 Pollution Survey Report (12) exhibited evidence that at this time the greatest factor contributing to the economy of the Pasquotank River Basin was agriculture, including lumber and pulpwood operations. Also, "an increasing effort is being made to reclaim lowlands... for farming..."(12). Welch and Knight (13) reported that between 1963 and 1974, 173,300 acres of commercial forest in the Northern Coastal Plain of North Carolina was diverted to other land uses - primarily cropland. Forty-three percent of the remaining forestland has been treated or significantly disturbed and the bottomland hardwoods have increasingly been converted through harvesting to oak and yellow-poplar cover types (13).

Of the 11,625 acres of forestland in the Bear Swamp watershed, 7,125 acres have been previously cleared of hardwoods and are being converted to pines. Those remaining acres of hardwoods in the area to be benefited by the project are predominantly ash and sycamore. The expected conversion of 400 acres of forestland to cropland as a result of the project deviates little from the general trend reported by Welch and Knight.

There are approximately 28,500 acres of oak-gum-cypress and 52,100 acres of oak-hickory forest types in Chowan and Perquimans Counties (13). The two Public Law 566 watershed projects completed in these counties (Pollock Swamp and Burnt Mill Creek) required clearing of an estimated 136 acres of hardwoods to provide rights-of-way for channel construction. The Bear Swamp project will require an additional clearing of 93 acres, 31 acres of which will be allowed to revert to forestland. The other completed P.L. 566 project in the Pasquotank River Basin (Folley Ditch, Gates County) required clearing of an estimated 60 acres of hardwoods for channel construction. The cumulative effect of these projects on the region's forestland is minimal, especially in respect to the established trend previously recognized in the Northern Coastal Plain.

The Corps of Engineers have included no channel excavation construction in their projects within the area.

Groundwater conditions, as documented by Harris and Wilder (3) and Brown (14), for the Bear Swamp Watershed are comparable to those reported by the Agricultural Research Service (15) for the Ahoskie Creek Watershed. In Ahoskie Creek the groundwater was recharged to near capacity each year with the existing channel system (15). Information on the amount of water available for recharge, the areas of recharge, and studies of similar projects

Alternatives

in the region substantiate the conclusion that the Bear Swamp project and associated projects in the region will have minimal cumulative effects on ground water supplies.

There are no other resource development plans that would affect or be affected by the project.

This project is compatible with projected future long-term uses of the land, water, and other natural resources. The land treatment program will provide more vegetative residue that will be incorporated into the soils. Soil and water conservation measures will reduce erosion; and, therefore, these soils will be conserved for future use. Downstream pollution will be reduced. Installation of this plan will protect and enhance the aesthetic and environmental values of the area. Reduction of erosion and conservation of soil fertility brought about by the program will protect the soil and water resources after the designed project life.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

About 93 acres of forestland (not including channel area) will be cleared, of which 54 acres will be converted to spoil placement and a maintenance travelway. Approximately eight acres will be committed to channels due to increased top widths over existing channels. The remaining 31 acres, used for debris disposal, will be allowed to revert to forestland after construction.

Of the channels in open land, two additional acres will be committed to permanent channels and eight acres converted to spoil placement and travelway.

Maintaining the channels and travelways so that they will continue to provide the planned flood and drainage relief, as well as serving as filter strips through open land, will preclude these areas from other uses in the future.

The labor and materials required for project installation will be permanently committed to flood prevention and drainage uses.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

General

Numerous public meetings have been held on Bear Swamp Watershed since local interest developed in the early 1960's. A formal application for assistance under the Public Law 566 program was submitted to the North Carolina Soil and

Consultation

Water Conservation Commission on November 22, 1965. After a field examination, in which interested individuals and representatives from other agencies were invited, the application was approved at the commission's regular meeting on January 5, 1966.

A preliminary investigation was made in 1967 by the Soil Conservation Service with assistance from representatives of the North Carolina Wildlife Resources Commission and the United States Fish and Wildlife Service and presented to the local people. The report of preliminary investigation included a description of existing habitat conditions and measures considered reasonable to provide for mitigation of damages by the proposed channel work. Soil Conservation Service representatives made a detailed investigation on a suitable 160-acre site for a wildlife wetland area.

Public hearings were held and drainage commissioners were elected. The proposed plan was approved for the project and the Service was asked by the chairman in a letter dated March 13, 1970, to "move forward in this program."

Biologists from the United States Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, and the Soil Conservation Service discussed ways and means of improving the fish habitat of the area. Studies indicated that overdigging about three miles of the lower portion of the main channel would assure a continuous water supply and increase fish habitat. It was found desirable and feasible to install a boat ramp and parking area for an access area.

A draft watershed work plan and environmental statement were prepared in 1971 and received a technical review. This proposed plan included the present plan plus 160 acres of wildlife wetland preservation, a boating access area with a parking lot at Secondary Road 1111, and a peripheral channel with fishery development around the wetland area from Lateral 5 down to Secondary Road 1111.

Opposition to the 1971 draft was raised in the degree of influence on fish and wildlife resources that might be realized from construction below lateral 5 (16). The proposed mitigative measures were questionable in lieu of the actual losses from construction below lateral 5. The Soil Conservation Service responded (17) with proposal to: (1) "terminate all channel work at lateral No. 5, (2) provide sediment traps at the junction of all major laterals and at the downstream termination point of the channel work, and (3) design main stream channel work with capacity to allow for natural vegetation to be re-established and uncontrolled." These measures would eliminate 3.3 miles of channel work, 160 acres of wildlife wetland preservation, and 2.6 miles of peripheral channel with fishery development. Approximately 250 acres of cropland would be dropped from the benefited category. These proposed changes were discussed with the sponsors.

Consultation

A field inspection was made November 14, 1973 in an effort to clarify specific details that had been noted in correspondence between the Soil Conservation Service, the Bureau of Sport Fisheries and Wildlife, the North Carolina Wildlife Resources Commission, and the sponsors (18). A meeting of representatives of these agencies was held on December 4, 1973 and an agreement reached to dispose of the cleared debris off the site and away from the swamp for the section of channel work between Secondary Road 1113 and lateral 5. Spoil placement was designed to assist the development of wildlife habitat in the area and one-sided construction was proposed for channels with widths of 30 feet or less (18). Further correspondence among the parties exhibited mutual agreement with the finalized draft and evidenced the value of the interagency approach to resource planning.

The sponsors were kept abreast of all actions by the agencies and public meetings were held on May 30, 1973 and January 18, 1974, at which time the sponsors approved the present proposed plan.

A review of the National Register of Historic Places (9) and an archaeological survey by the North Carolina Department of Cultural Resources, Division of Archives and History (19) provided no evidence of any sites of historical or archaeological value within the proposed project area.

The Soil Conservation Service and the sponsors will obtain, if needed, any permits applicable under Section 404 of the Federal Water Pollution Control Act Amendments of 1972. Project design is such as to maximize prevention of the discharge of dredge or fill material and the washing into the stream of spoil, etc., deposited on the banks. Permits, if required will be obtained from the Environmental Protection Agency or the United States Department of the Army, Corps of Engineers, prior to construction.

The following agencies were asked to comment on the draft environmental statement:

United States Department of the Army, Corps of Engineers; United States Department of Commerce; United States Department of Health, Education, and Welfare; United States Department of the Interior; United States Department of Transportation; Environmental Protection Agency; Federal Power Commission; Advisory Council on Historic Preservation; North Carolina Department of Natural and Economic Resources (for the Governor); North Carolina Department of Administration, State Planning Division (State Clearinghouse); and other interested parties.

Comments have been received from the following agencies:

Environmental Protection Agency; United States Department of Commerce; United States Department of the Interior; Department of Transportation, United States Coast Guard; North Carolina Department of Administration, State Planning Division (State Clearinghouse) and North Carolina Department of Natural and Economic Resources.

Consultation

A summarization of comments received on the draft environmental impact statement together with appropriate responses are listed below:

United States Environmental Protection Agency

1. Comment Summary - A rating of LO (Lack of Objection) to the impact of the action and 1 (adequate) to the impact statement has been assigned to the project.

Response - No response necessary.

United States Department of Commerce, Assistant Secretary for Science and Technology

1. Comment Summary - The draft environmental impact statement is lacking sufficient information regarding project effects on marine, estuarine, and anadromous fishery resources.

Response - The effects on anadromous fish is discussed on page 26. There are no anticipated effects on marine and estuarine resources and, therefore, a discussion in the statement is not needed. Also, see response to comment No. 8.

2. Comment Summary - The species of anadromous fish found in the project area should be identified and the extent to which they use the watershed should be discussed.

Response - This subject is discussed on page 13 of the statement.

3. Comment Summary - The cumulative effects of projects of this type on anadromous fish spawning habitat and of "increased silt, pesticides, herbicides, and coliform bacteria contained in runoff" should be discussed.

Response - Due to compromises reached during the planning phase, this project is not expected to have a significant adverse effect on anadromous fish resources. Consequently, a discussion of this subject is not pertinent. Pages 25-26 contain a discussion of the other items cited and on page 30 is a discussion of the long-term effects of the project on agricultural pollution.

4. Comment Summary - A complete project description including detailed project maps with the scaled diagrams of proposed channels and disposal areas with exact locations is needed to adequately assess project effects.

Response - Detailed project drawings are not made in the planning stage of a project. However, the structural measures portion of the Planned Project section has been rewritten to state that new construction will follow existing channels and that spoil will be placed along both sides

Consultation

of the channel on the main up to Lateral 2 (see project map) and on one side of the remaining channels. The statement concerning the removal of debris between the lower crossing of SR 1113 and the end of construction has been moved to the Planned Project section also.

5. Comment Summary - There should be a discussion of proposed measures to control turbidity caused by run-off of silts, clays, and other particulate matter.

Response - The Planned Project section, page 7, discusses sediment traps and temporary seeding of spoil and channel banks as measures to control turbidity. See also response to comment No. 3 page 34.

6. Comment Summary - Wetlands types involved in the project should be completely described rather than referring to Types 1 and 7.

Response - An omission was made in the draft by failing to include U.S. Fish and Wildlife Circular 39 entitled "Wetlands of the United States" in the bibliography. This will be corrected. This reference is available, however, and we do not feel it necessary to include quotes from it in this statement.

7. Comment Summary - An inventory of all aquatic organisms known to occur in the project area should be provided and the species composition and relative abundance of the 242 fish food organisms referred to on page 12, paragraph 4 should be given.

Response - Available information on the fish and wildlife resources has been incorporated into the statement on pages 12-13. The Wildlife Resources Commission publication which cites the 242 fish food organisms (Ave. no./ft.²) does give information on species composition and relative abundance and the reviewer is referred to this publication for detailed information.

8. Comment Summary - A more complete and detailed evaluation of project effects on anadromous fish is needed.

Response - The effects on anadromous fish were given great consideration during the planning phase of this project. The compromise discussed on pages 32-33 was reached in part due to these considerations for anadromous fish. Consequently, we feel that our statement on page 26 does adequately describe project effects on anadromous fishery resources.

9. Comment Summary - The Alternatives Section should include a discussion of the effects of providing larger openings at road crossings.

Response - It should be noted, as stated on page 7, only one road (SR 1113) on the main channel where road fills have been constructed across channels and adjoining floodplain requires modification. Most

Consultation

of the roads constructed across the laterals are on average ground and offer no constriction to floodplain flows. Road modifications listed in the statement require a lower culvert elevation to permit internal drainage of the adjoining cropland as well as additional capacity to equal capacity of designed channels. The Service concludes, therefore, that road modification only would not be a feasible alternative. See also response to Department of Natural and Economic Resources comment No. 8, page 41.

United States Department of the Interior

1. Comment Summary - Several important environmental quality needs have been overlooked in the environmental quality plan while less relevant considerations have been over emphasized. Environmental quality objectives are enhanced by management, conservation, preservation, creation, restoration, or improvement of natural ecological systems and not by 17.3 miles of channel work.

Response - According to USDA Procedures for Planning Water and Related Resources, March, 1974, the environmental quality plan should enhance "environmental quality by the management, conservation, preservation, creation, restoration or improvement of the quality of certain natural and cultural resources and ecological systems". (Emphasis added) An evaluation of the EQ plan should include: 1) Areas of natural beauty 2) Water, land, and air quality; 3) Biological resources and selected ecosystems; 4) Geological, archaeological, and historical resources and 5) Irreversible or irretrievable commitment of resources. The Service feels that the abbreviated EQ plan as presented in the addendum is a viable plan with emphasis on the environment even though it might not be the plan that a particular interest group would develop.

2. Comment Summary - "Our major concern with this project was expressed by the Department's Fish and Wildlife Service in a report dated November 11, 1971. Destruction of stream habitat and associated wooded swamp and seasonally flooded bottom lands below lateral 5 were cited as conflicts. However, project modification, including the deletion of channel work below lateral 5, and the construction of sediment traps, have largely removed the project of major alteration of the valuable downstream area; and have greatly improved this project in terms of minimizing potential adverse effects on fish and wildlife resources"

Response - No response needed.

3. Comment Summary - Land treatment measures will provide cover for upland wildlife and will reduce run-off of agricultural chemicals. These measures should be required in order to insure realization of these benefits.

Response - The land treatment measures included in the project are based on need and time and money available during the installation of the project. It is therefore reasonable to expect these measures to be installed. The Service recognizes land treatment measures as necessary to realize benefits on the project in the Environmental Impact section page 24.

4. Comment Summary - The effects that increased turbidity and siltation can have on aquatic organisms makes it imperative that sediment traps be constructed prior to channel work and be maintained. Project construction should not be allowed between March 1 and July 1 since this is the peak time of biological activity.

Response - A sediment trap will be constructed at the lower end when channel work commences. Additional sediment traps will be constructed as construction approaches the junction of major tributaries with the main channel. Because of the sediment control measures such as sediment traps, temporary seeding, and stopping channel work at Lateral 5 the Service concluded that stopping construction during March-July would not be necessary. See comment No. 3 page 34.

5. Comment Summary - The statement does not provide either an adequate description of biological resources found in the watershed nor of the project impact on these resources.

Response - Information which was available on the biological resources is included in the statement on page 12-13. Due to compromises reached during the planning phase, this project is not expected to have significant effect on existing resources and the discussion cited is considered adequate. This fact is apparently recognized in the comments on the work plan.

6. Comment Summary - A specific objective listed for the project is to improve fish habitat. The plan does not include measures for this purpose and consequently, this objective should be deleted.

Response - Original planning efforts on this project did contain several measures designed to improve fish and wildlife habitat as well as hunter-fisherman use of these resources. These measures were developed in cooperation with representatives from the N. C. Wildlife Resources Commission. At a later time, however, these measures, which were designed to manage habitat, were rejected as unsuitable by that Commission and by your Bureau and an alternative plan was developed which will "preserve" (leave in this present state) the major portion of the fish and wildlife habitat in the watershed. A discussion of this is found on pages 32 and 33 of the statement. The original intent of the sponsors could not be fulfilled to the satisfaction of other interested agencies. However, this does not mean that the sponsors' objectives were changed and we feel that the inclusion of this objective in the statement is pertinent.

Consultation

7. Comment Summary - The section on plant and animal resources does not fully describe the fish and wildlife resources. A discussion should be included describing all major game and nongame species including such factors as relative abundance of important species.

Response - As was recognized in comment no. 2 page 36 - i.e., "...project modificationshave largely removed the prospect of major alteration of the valuable downstream area and have greatly improved this project in terms of minimizing potential adverse effects on fish and wildlife resources." -- Alternatives were developed in this project which in large measure maintain fish and wildlife habitat in its present state. Consequently, this Service believes that to include extensive discussions of fish and wildlife species is not warranted since significant impacts on these resources are not anticipated.

8. Comment Summary - The species of herring utilizing the stream reach to be channeled below SR 1110 is not specified. Also, the extent of spawning in this reach is not given.

Response - Research to date indicates only that "river herring" utilize Goodwin Creek upstream to SR 1113 (near Junction with SR 1114). Egg collections have provided this information and is not possible to distinguish species from egg collection. Information on extent of spawning is also vague although in one study five samples were taken on the creek with only two eggs recovered.

(Source: Anadromous Fisheries Research Program - Northern Coastal Region - Albemarle Sound and Tributaries, North Carolina, NC DNER Project AFCS-8, Jobs, 1, 2, 4, 5, and 6. Street and Pate, 1974).

9. Comment Summary - The environmental impact statement is acceptable from the standpoint of mineral resources.

Response - No response needed.

10. Comment Summary - A specific evaluation of the magnitude and significance of the change in the water-table of the shallow unconfined aquifer between normal and flood flows should be made.

Response - Under normal conditions the top 2-4 foot section of the soil profile is aerated permitting penetration and development of root systems of growing crops. During wet or flood conditions this zone becomes saturated thereby damaging or destroying the root system. The primary purpose of this project is to decrease the duration and frequency of the saturation. A discussion on the effects of the project on ground water has been added on page 26. See the discussion of drainage problems, page 18; environmental impacts, page 25 and the response to N. C. Department of Natural and Economic Resources comment no. 8 on page 41.

11. Comment Summary - The section on structural measures should be expanded to discuss the effects of converting 400 acres of forest land to cropland and the clearing of 93 acres of forest land for channel improvement. "The net result of this habitat destruction will be a reduction of wildlife populations resulting from the displacement of individuals to adjacent undisturbed areas."

Response - The effects of this land use conversion are recognized on page 28, Adverse Environmental Effects, Item F.

Technically, there are serious questions about the validity of the comment regarding a net reduction of wildlife population in the watershed as a result of a land use change which will convert 493 acres of a total 11,625 acres of forest land to other uses. Your statement is apparently based on the assumption that 400 of these acres will be cleared in one contiguous block. This, in all probability, will not be the case. A land use change to cleared fields interspersed with woodland areas will in many cases create more "edges" which are generally beneficial to most of the wildlife species found in this watershed. The only species in which a reduction in population may occur is the gray squirrel. However, overall wildlife populations will probably benefit from the creation of these additional "edges."

12. Comment Summary - It is not clear whether the 31 acres of forestland cleared during project construction that will revert to forestland in the future will be natural succession or replanting.

Response - The statement has been revised to show the 31 acres will revert naturally to forestland instead of replanting.

13. Comment Summary - "The potential for temporary damage to fishery resources is acknowledged; however details are not provided." The potential details on the aquatic resources of Bear Swamp should be thoroughly discussed in the final statement.

Response - See response to comment nos. 1 and 3.

Department of Transportation, United States Coast Guard

1. Comment Summary - We have reviewed the material submitted and have no comments to offer nor objection to the project.

Response - No response necessary.

Consultation

North Carolina Department of Administration

The Department of Administration, acting as the state clearinghouse, transmitted the comments from the North Carolina Department of Natural and Economic Resources summarized below.

North Carolina Department of Natural and Economic Resources

1. Comment Summary - Page 6 of the EIS states that trees to be left along side the channel will be marked by the SCS biologist and engineer. Page 22 of the work plan states that trees will be marked by N. C. Foresters and the SCS biologist and engineer.

Response - The work plan has been changed to agree with the environmental impact statement.

2. Comment Summary - The 7,125 acres of forest land cleared of hardwood species and being converted to pines were actually mixed stands of pines and hardwoods. The plantations, although chiefly pines, will be mixed with natural hardwoods.

Response - The statement has been revised according to the comment on pages 11-12 under Plant and Animal Resources section.

3. Comment Summary - Approximately 59 percent of open land will receive land treatment measures. This agrees with DNER's request that at least 50 percent of open land be treated prior to or in proper sequence with construction.

Response - No response needed.

4. Comment Summary - The sponsors should attempt to have local county governments adopt floodway regulations. It is unlikely the N. C. Environmental Management Commission will approve this project without such measures.

Response - Floodway maps have been prepared and the sponsors have been made aware of the Environmental Management Commission position.

5. Comment Summary - If the N. C. Sedimentation and Pollution Control Act of 1973 is determined by the Attorney General's office to be applicable, an erosion and sediment control plan would be required. The project plan may require additional seeding to comply with the Act.

Response - It is the policy of the Soil Conservation Service to comply with all statutes and regulations of the State.

Consultation

6. Comment Summary - Revisions of the work plan conform with the agreement that the Wildlife Resources Commission reached with the SCS in late 1973. The Commission therefore has no objection to the project as now proposed.

Response - No response needed.

7. Comment Summary - Although anadromous fish spawning and nursery areas do not extend into the project area, changes in flow or drainage patterns may have an adverse effect. This issue should be addressed in more detail in the final EIS.

Response - See response to Department of the Interior comments no. 1 and no. 3 on pages 36 and 37.

8. Comment Summary - Figure 3 on page 11 of the work plan indicates culvert capacities at road crossings are a prime cause of floodwater backup. The degree by which damage could be reduced by improving culverts should be considered as a sub-alternate of Channel Work and Floodwater Storage.

Response - The top photo of Figure 3 shows the conditions on the downstream side of Secondary Road 1312. The lower photo shows Secondary Road 1102 which has no road fill. See response to U.S. Department of Commerce comment no. 8 page 35.

9. Comment Summary - The EIS states that the water table will be lowered on approximately 5,450 acres in the watershed. What is the amount of lowering which will take place?

Response - The project is designed to permit drainage of the upper 2-4 feet of the soil profile to allow root penetration and development. The maximum drainage would be limited by the depths of channels which vary from 3 to 6 feet.

10. Comment Summary - Some discussion should be made in the final EIS of the project's effect on groundwater recharge of the underlying aquifers.

Response - A discussion of the effects of the project ground water has been added on page 26 of the final statement.

LIST OF APPENDIXES

- Appendix A - Comparison of Benefits and Cost for Structural Measures
- Appendix B - Project Map
- Appendix C - Problem Location Map
- Appendix D - Bibliography
- Appendix E - Letters of Comment Received on the Draft Environmental Statement

Approved by



Jesse L. Hicks
State Conservationist

Date February 17, 1976

APPENDIX A - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

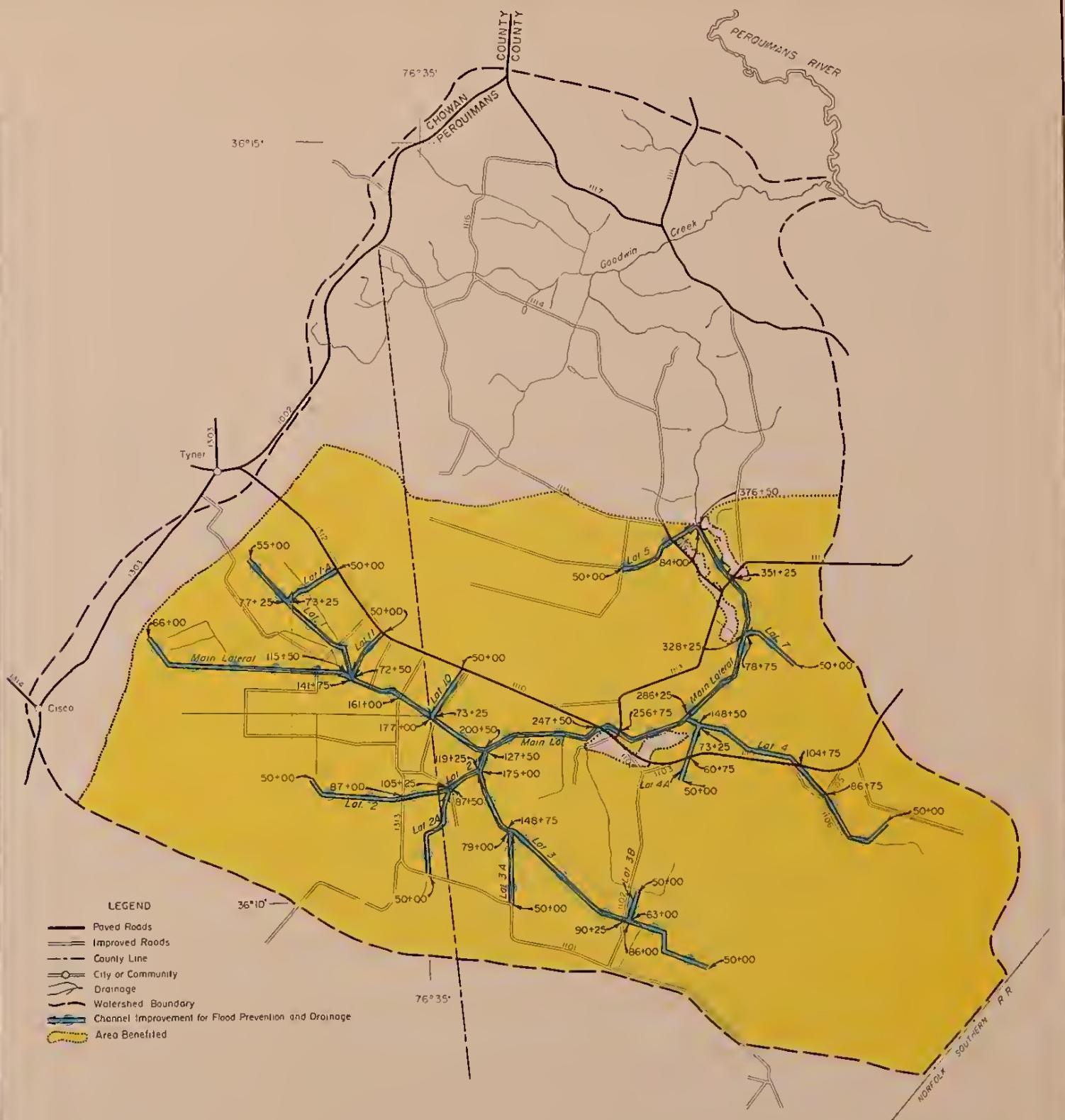
Bear Swamp Watershed
Chowan and Perquimans Counties, North Carolina
(Dollars)

Evaluation Unit	AVERAGE	ANNUAL	BENEFITS ^{1/}	Average : Annual	BENEFIT : Cost
	Damage : Reduction	: Drainage	: Secondary : Redevelopment	Total	Cost ^{2/} : Ratio
Stream Channel Work	26,915	23,565	6,530	5,025	61,820 33,660 1.8 to 1.0
Project Administration	xxxxxx	xxxxxx	xxxxx	xxxxx	2,775 xxxxxxxxxxxx
Total	26,9153/	23,565	6,315	5,025	61,820 36,435 1.7 to 1.0

1/ Price base: Adjusted Normalized and 1975.
2/ Operation and maintenance cost of \$10,500 based on 1975 prices. The remaining cost is amortized at 5 7/8 percent interest rate over 50 years.
3/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$2,990 annually.

Date: May 1975





**PROJECT MAP
BEAR SWAMP WATERSHED
CHOWAN AND PERQUIMANS COUNTIES, NORTH CAROLINA**



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VICINITY MAP

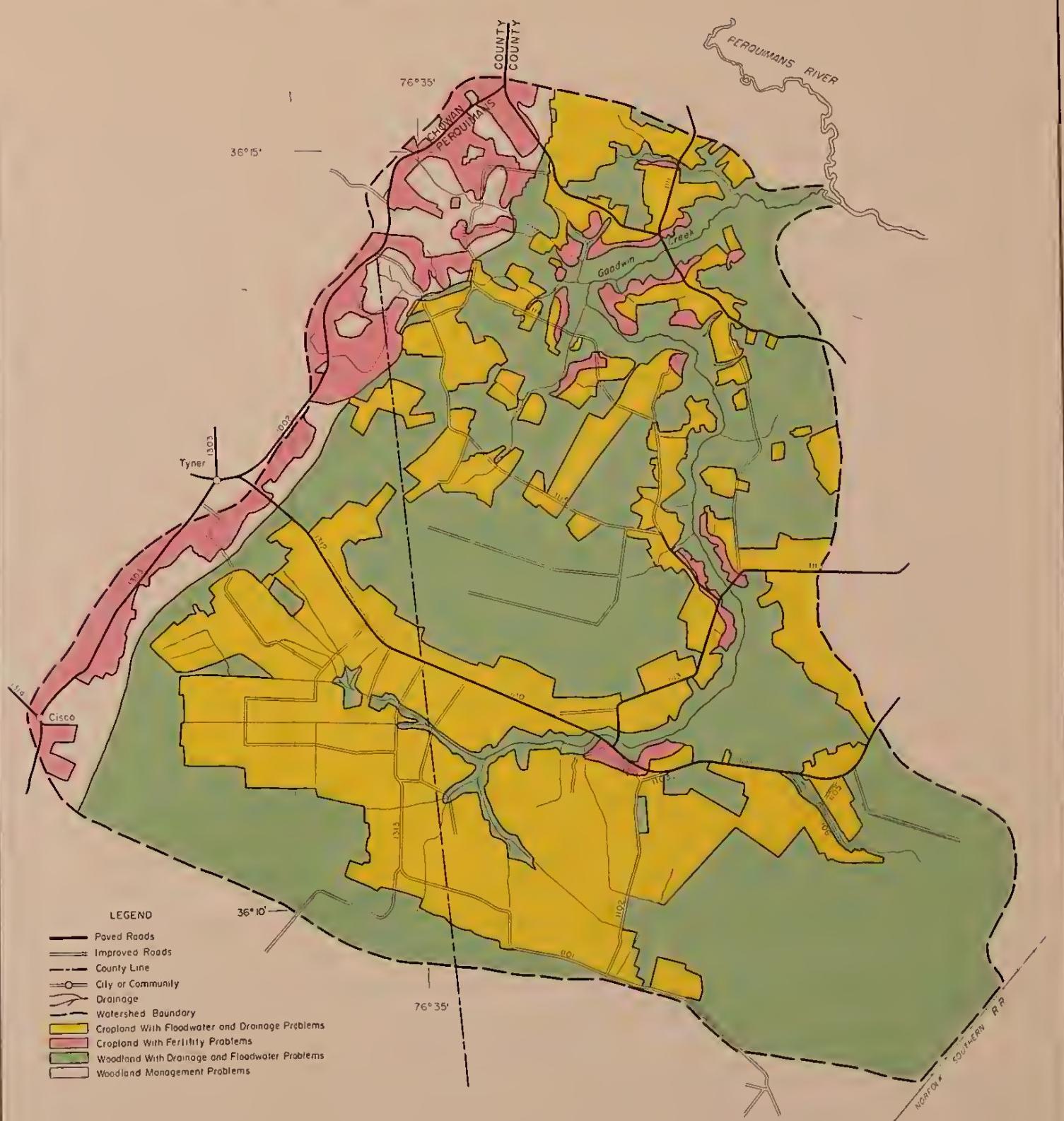
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APPROXIMATE SCALE - MILES

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and extended in U. S. 2001

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REVISED APRIL 1974

Rev 1-70 4-R-28920



**PROBLEM LOCATION MAP
BEAR SWAMP WATERSHED**
CHOWAN AND PERQUIMANS COUNTIES, NORTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
RALEIGH, NORTH CAROLINA



8 MILES
APPROX. MILES 4 8 12 16
I-70 4-R-28619
Rev I-70 4-R-22595



BIBLIOGRAPHY

1. North Carolina Department of Conservation and Development, Travel and Promotion Division. Official 1970 Census - Information Bulletin Number 131, February, 1971.
2. Water Resources Council, Washington, D. C. Water Resources Regions and Subregions for the National Assessment of Water and Related Land Resources, July, 1970.
3. Harris, W. H., and H. B. Wilder. 1966. Geology and Ground-Water Resources of the Hertford-Elizabeth City Area, North Carolina. North Carolina Dept. Water Resources, Ground Water Bulletin 10, 89 p.
4. North Carolina Department of Natural and Economic Resources, Water Quality Division. Schedule and Classification Adapted and Assigned to Waters of the Pasquotank River Basin, January, 1961.
5. North Carolina Department of Administration, Statistical Services Section. Profile of North Carolina Counties, Third Edition, January, 1973.
6. Wetlands of the United States, United States Department of the Interior, U. S. Fish and Wildlife Service, Circular 39, 1956.
7. Survey and Classification of the Perquimans-Pasquotank-North Rivers and Tributaries, North Carolina by William B. Smith and W. Donald Baker, North Carolina Wildlife Resources Commission, Raleigh, North Carolina, 1965.
8. United States Department of Commerce, Bureau of the Census, United States Census of Agriculture, Volume 1, Part 26, North Carolina, 1964.
9. United States Department of the Interior, National Park Service. National Register of Historic Places, 1970.
10. Broadfoot, W. M. and H. L. Williston, Flooding Effects on Southern Forests, 1973. Journal of Forestry 71(9):584-587.
11. Advanced Interpretation of Research Data and Analyses Ahoskie Creek Watershed, North Carolina, United States Department of Agriculture, Agricultural Research Service, December, 1973.
12. North Carolina Department of Water Resources, Division of Stream Sanitation and Hydrology, The Pasquotank River Basin, Pollution Survey Report 8, 1957. 166 p.
13. Welch, R. L., and H. A. Knight. 1974. Forest Statistics for the Northern Coastal Plain of North Carolina, 1974. U. S. Dept. of Agr. Forest Service Resource Bulletin SE-30, 33 p.

14. Brown, P. M. 1959. Geology and Ground-Water Resources in the Greenville Area, North Carolina Department Conserv. Develop. Bulletin 73, 87 p.
15. Agricultural Research Service, U. S. Dept. Agr. 1975. Hydrology and Hydrogeology, Ahoskie Creek Watershed, North Carolina, Data and Analysis. Southeast Watershed Laboratory, Georgia, Unpubl. Draft. 266., p., 1. Appendix.
16. Report on Bear Swamp Watershed dated November 11, 1971, to Mr. Jesse L. Hicks, State Conservationist, Soil Conservation Service, from Mr. C. Edward Carlson, Regional Director, United States Bureau of Sport Fisheries and Wildlife.
17. Statement, with attachment, 10 October 1973, to Colonel Clyde P. Patton, Executive Director, North Carolina Resources Commission, from Mr. Jesse L. Hicks, State Conservationist, Soil Conservation Service.
18. Statement, with attachment, 14 December 1973, to Colonel Clyde P. Patton, Executive Director, North Carolina Resources Commission, from Mr. Jesse L. Hicks, State Conservationist, Soil Conservation Service.
19. North Carolina Department of Cultural Resources. 1975. An Archaeological Survey of the Bear Swamp Watershed. Division of Archives and History. 28 p.

APPENDIX E

COMMENTS ON BEAR SWAMP WATERSHED Chowan and Perquimans Counties, North Carolina

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

1421 PEACHTREE ST., N. E.
ATLANTA, GEORGIA 30309

September 8, 1975

Mr. Jesse L. Hicks
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
P. O. Box 27307
Raleigh, North Carolina 27611

Dear Mr. Hicks:

We have reviewed the Draft Environmental Impact Statement for Bear Swamp Watershed in Chowan and Perquimans Counties, North Carolina, and have no objections to the project if the stated precautions for the control of erosion and water pollution are followed during construction of the project.

We also have determined that the construction of the proposed project will not affect the ambient air quality.

We therefore have rated the project LO- (lack of objections) to the impact of the action and 1 (adequate) to the Impact Statement.

We would appreciate receiving a copy of the final environmental impact statement when it is available, and if we can be of further assistance, please let us know.

Sincerely,

A handwritten signature in cursive ink that appears to read "David R. Hopkins".

David R. Hopkins
Chief, EIS Branch



UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

September 25, 1975

Mr. Jesse L. Hicks
United States Department of Agriculture
State Conservationist
Soil Conservation Service
P.O. Box 27307
Raleigh, North Carolina 27611

Dear Mr. Hicks:

The draft environmental impact statement, "Bear Swamp Watershed, Chowan and Perquimans Counties, North Carolina," which accompanied your letter of July 11, 1975, has been received by the Department of Commerce for review and comment.

The statement has been reviewed and the following comments are offered for your consideration.

General Comments

The draft environmental impact statement is lacking sufficient information regarding project effects on marine, estuarine and anadromous fishery resources. The species of anadromous fish found in the project area should be identified and the extent to which they use the watershed should be discussed. Since numerous watershed projects have been completed or planned for northeastern North Carolina, the draft environmental impact statement should discuss the cumulative effects of this and other watershed projects on spawning habitat for anadromous fish, and the downstream effects of increased silt, pesticides, herbicides, and coliform bacteria contained in the runoff.

Specific Comments

Page 5 - Structural Measures. To adequately assess project effects, a more complete project description is needed, including detailed project maps with scaled diagrams of proposed channels and disposal areas with exact locations.

Page 7, paragraph 2. This paragraph should discuss the proposed measures, if any, to control turbidity caused by run-off of silts,



clays and other fine particulate matter. Accordingly, the draft environmental impact statement should completely discuss the downstream effects of increased introduction of fine particulate matter.

Page 11, paragraph 6. Wetland types involved in the project should be completely described, rather than referring to types 1 and 7.

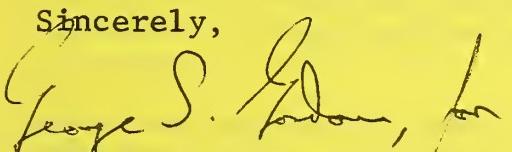
Page 12, paragraph 1. An inventory of all aquatic organisms known to occur in the project area should be provided. This section should also indicate the species composition and relative abundance of the 242 fish food organisms found in the sample.

Page 24, paragraph 2. A more complete and detailed evaluation of project effects on anadromous fish is needed. Simply stating that spawning areas for anadromous fish could be slightly damaged does not constitute an adequate assessment of project effects on these organisms.

Page 25. This section should discuss the additional alternative of providing larger openings in road fills across the various drainage systems, or replacing the road fills with bridges.

Thank you for giving us an opportunity to provide you with these comments, which we hope will be of assistance to you. We would appreciate receiving four (4) copies of the final statement.

Sincerely,



Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER-75/691

OCT 14 1975

Dear Mr. Hicks:

Thank you for the letter of July 11, 1975, requesting our views and comments on the work plan and draft environmental statement for Bear Swamp Watershed, Chowan and Perquimans Counties, North Carolina. The following comments are offered for your consideration.

Work Plan

In the abbreviated environmental quality plan for the Bear Swamp Watershed, several important environmental quality needs have been overlooked while less relevant considerations have been overemphasized. Moreover, it appears that input has not been solicited from any other State or Federal agencies, public sectors, or private conservation organizations. The Principles and Standards state that a broad spectrum of public groups and interests must be considered and consulted in the identification of components for environmental quality objectives.

One shortcoming of the abbreviated environmental quality plan for Bear Swamp is exemplified by the weighted component need for agricultural interests as they relate to needs for flood control and drainage (17.3 miles of channel work). Instead of flood control and drainage as a component need in the environmental quality plan, land treatment and management for the establishment, preservation, and/or conservation of natural ecosystems should be considered.

Environmental quality, as defined in the Principles and Standards, specifically states that explicit recognition should be given to the desirability of diverting a portion of the nation's resources from the production of market-oriented goods and services to the accomplishment of environmental objectives. Environmental quality objectives are enhanced by management, conservation, preservation, creation, restoration, or improvement of natural ecological systems. These objectives are not enhanced by 17.3 miles of channel work that will adversely affect present fish and wildlife conditions.



Save Energy and You Serve America!

Our major concern with this project was expressed by the Department's Fish and Wildlife Service in a report dated November 11, 1971. Destruction of stream habitat and associated wooded swamp and seasonally flooded bottom lands below lateral 5 were cited as conflicts. However, project modifications, including the deletion of channel work below lateral 5, and the construction of sediment traps, have largely removed the prospect of major alteration of the valuable downstream area; and have greatly improved this project in terms of minimizing potential adverse effects on fish and wildlife resources.

If implemented, the present work plan will involve the excavation of previously modified stream sections, and the clearing of 93 acres of forest land. Thus the fishery resources in these stream sections will be adversely affected by habitat destruction and downstream fisheries will be exposed to possible water quality changes caused by increased sediment, pesticide, and fertilizer levels. Affected wildlife populations will be reduced by the loss of forest-land habitat. Some of the land treatment measures will provide cover for upland wildlife and will reduce the runoff of agricultural chemicals, and these measures should be required in order to insure the realization of these benefits.

The increased turbidity and siltation expected from channel excavation and land clearing, and the disastrous effects these increases can have on aquatic organisms, make it imperative that planned sediment traps be constructed prior to channel excavation and be maintained regularly. The clearing of trees and other natural vegetation should be kept to a minimum, and spoil areas and channel banks should be seeded as quickly as possible to minimize erosion into streams. Since spring months are the peak time of biological activity, project construction should not be allowed between March 1 and July 1. This was recommended in the Fish and Wildlife Services 1971 report on this project, and will protect spawning resident and anadromous fishes from turbidity and siltation associated with channel excavation.

Draft Environmental Statement

The draft environmental statement contains a cursory description of the biological resources in the Bear Swamp Watershed and provides only a superficial discussion of the environmental impacts

expected from this project. This project will result in adverse impacts on fish and wildlife resources in the channelized stream sections and in downstream areas. We believe that the environmental statement should provide a complete description of known resources in the project area, and a thorough evaluation of foreseeable impacts on these resources. Several specific comments are arranged by page numbers below.

Page 1, paragraph 2 - One of the specific objectives listed for this project is the improvement of fish habitat. However, project plans do not include means by which this objective is to be accomplished. On the contrary, fish habitat in the channelized stream sections will be severely damaged, and fisheries in downstream reaches will be subjected to adverse effects resulting from the faster removal of water from agricultural lands. Therefore, this objective should be deleted.

Pages 11 and 12, Plant and Animal Resources (Flora and Fauna) - The description of plant and animal resources should be revised to fully describe the fish and wildlife resources of the Bear Swamp Watershed. This should include a complete discussion of all furbearers, game birds and animals, and major nongame groups including songbirds, wading birds, and birds of prey. This section should provide information concerning the relative abundance of the important species or groups.

The spawning of herring in the reach of stream below Secondary Road 1110 which is planned for channel work is acknowledged on page 12, paragraph 2; however, the particular species involved are not specified, nor is the extent of spawning given. Both blueback herring and alewife occur in this area, and both could utilize this stream section as spawning habitat. Although this stream has been previously altered, it has partially recovered. Benthic communities have become reestablished, and streambed cover and bank vegetation, which provide spawning habitat for anadromous herring, are present. This stream section also contains sufficient flows to support fair populations of resident fishes.

Page 12, Economic Resources - Current mineral production in Chowan and Perquimans Counties consists of only nominal amounts of sand and gravel. The potential of mineral resources underlying the watershed is unknown. However, proposed project works should not result in any significant impact of such resources. The documents are acceptable in this aspect.

Page 20, Water and Related Land Problems - Physical and hydro-logic characteristics of the aquifer materials should be more completely summarized. Although we suspect that the impacts on ground water will generally not be adverse, and indeed probably will be beneficial, we believe that the statement should evaluate more fully specific impacts. In particular, inasmuch as the statement comments on the importance of ground water in the area, we believe the document should include a specific evaluation of the magnitude and significance of the lowering which the water-table of the shallow, unconfined aquifer will sustain. This change should be evaluated in terms of the water-table conditions under normal and flood flow in the proposed channels and in terms of the pre-project saturated thickness. The indication that septic drain fields will function more efficiently (page 25, Environmental Impact Statement; page 28, Work Plan), a beneficial impact on ground water, suggests more than superficial lowering of the water-table and needs further explanation. Appraisal of the statement's evaluation of impacts would also be aided if at least typical details on depth, cross-section, and gradient of the channels were included.

Page 23, paragraphs 4 and 6, Structural Measures - This section should be expanded to include a discussion of the effects on wildlife of converting 400 acres of forest land to cropland, and the clearing of 93 acres of forest land for channel enlargement, spoil deposition, and debris disposal. The net result of this habitat destruction will be a reduction of wildlife populations resulting from the displacement of individuals to adjacent undisturbed areas.

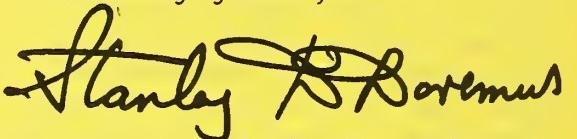
The statement is made that 31 acres of forest land cleared during project construction will revert to forest land in the future. However, it is not clear whether this will occur by natural succession or if these acres will be replanted. This point should be clarified in the final statement.

Page 24, paragraph 2, Structural Measures - The potential for temporary damage to fishery resources is acknowledged; however details are not provided. The fishery resources in the channelized stream sections will be adversely affected by destruction of benthic habitat and streambank vegetation, and by increases in siltation and water temperature. Herring spawning will be reduced as a result of this loss of habitat. Downstream fisheries will be affected by increased sediment,

pesticide, and fertilizer loads, and by possible changes in BOD, dissolved oxygen, and nutrient levels caused by these increases. These potential impacts on the aquatic resources of Bear Swamp should be thoroughly discussed in the final statement.

We hope these comments and suggestions will be of assistance to you.

Sincerely yours,



Deputy Assistant Secretary of the Interior

Mr. Jesse L. Hicks
State Conservationist
Soil Conservation Service
Department of Agriculture
Post Office Box 27307
Raleigh, North Carolina 27611



**DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD**

MAILING ADDRESS:
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• 11 SEP 1975

Mr. Jesse L. Hicks
State Conservationist
Soil Conservation Service
P. O. Box 27307
Raleigh, North Carolina 27611

Dear Mr. Hicks:

This is in response to your letter of 11 July 1975 addressed to the Commandant, U. S. Coast Guard concerning a draft environmental impact statement for the Bear Swamp Watershed, Chowan and Perquimans Counties, North Carolina.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

Sincerely,

A handwritten signature in black ink, appearing to read "D. J. Riley".

D. J. RILEY
Captain, U. S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant

North Carolina Department of Administration

JAMES E. HOLSHouser, JR., GOVERNOR

• BRUCE A. LENTZ, SECRETARY

September 17, 1975

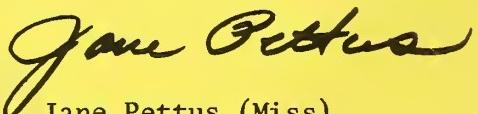
Mr. Jesse L. Hicks
State Conservationist
Post Office Box 27307
Raleigh, North Carolina

Dear Mr. Hicks:

Re: Draft Environmental Impact Statement
and Work Plan, Bear Swamp Watershed
SCH File No. 083-75

Enclosed you will find comments on the above reference, for
your use and file.

Sincerely yours,



Jane Pettus (Miss)
Clearinghouse Supervisor

JP:mw

Enclosure 2

E-10

SEP 05 1975

MEMORANDUM

September 4, 1975

TO: Jane Pettus

FROM: Art Cooper

SUBJECT: SCH File No. 083-75; Draft EIS and Work Plan, Bear Swamp Watershed,
Chowan and Perquimans Counties, North Carolina

The Department of Natural and Economic Resources has reviewed the subject documents and has the following comments:

Forest Resources

Page 5 (EIS) states..."The Service biologist and engineer will cruise this area prior to construction to mark trees to be left." Page 22 (Work Plan) states..."The N.C. Forester and the SCS biologist and engineer will cruise this area prior...left." These two statements should be brought into agreement.

Page 10, 11 and 27 (EIS) mentions that 7,125 acres of forest land have been cleared of hardwood species and are being converted to pine. Actually, the reforested acres were mixed stands of pine and hardwoods that were harvested. They were not hardwood sites that are being converted to pines as the EIS implies. The plantations, while chiefly pines, will also be mixed with natural hardwoods.

Land Treatment Measures

The percentage of open land (crop, pasture and idle or miscellaneous) to receive one or more land treatment measures will be approximately 59%. This is in accordance with DNER's requests that at least 50% of open land be treated prior to or in proper sequence with project construction.

Floodplain Delineation

DNER strongly urges the sponsors to establish a floodway along the main stem from the confluence with lateral 2 to the confluence with the Perquimans River. Since SCS has floodway maps of most of this reach, floodway delineation can be made without developing a great deal of additional data. Once this is done, the sponsors should attempt to have the local county governments adopt floodway regulations pursuant to North Carolina General Statute 143-215. It is unlikely that the N.C. Environmental Management Commission will approve this project until such measures are in effect.

September 4, 1975

Sedimentation Control

The N.C. Sedimentation Pollution Control Act of 1973 excludes land-disturbing activities undertaken on agricultural lands; however, at present the Land Quality Section, Division of Environmental Management, has requested a ruling from the Attorney General's Office related to the Act's jurisdiction with regard to PL 566 projects. If the Act is determined applicable, an erosion and sediment control plan will be required for land-disturbing activities as described in the Work Plan. This plan would not require a significant increase in the planned structural measures of the project, but may require additional seeding to comply with the mandatory standards of the Act.

Wildlife and Fishery Resources

Review by the N.C. Wildlife Resources Commission indicates that revisions of the original work plan are in conformance with the agreement that the Wildlife Resources Commission reached with SCS in late 1973. Consequently, the Wildlife Resources Commission has no objection to the Project as presently proposed.

The Division of Marine Fisheries, DNER, has indicated concern over potential adverse effects of the project on anadromous fishery spawning and nursery grounds in the Godwin Creek system. Although spawning and nursery areas of this system do not extend into the project area, any change in flow or drainage patterns may have an adverse effect. It is recommended that this issue be addressed in the final EIS in somewhat more detail than the one sentence dedicated to this item on page 24 of the EIS. Personnel from the Division of Marine Fisheries will be available to discuss this issue with SCS staff.

Hydrology

Page 11, Figure 3, Work Plan, indicates that insufficient culverts at road crossings are a prime cause of floodwater backup. The degree to which the problem of flooding in the project area could be alleviated by only improving culverts should be considered as a sub-alternative of *Channel Work and Floodwater Storage*, p. 25, EIS. It is requested that this be done in the final EIS.

Page 22, EIS, states that the project will result in the lowering of the water table on approximately 5,450 acres in the watershed. What is the estimated amount of lowering which will take place?

Some discussion should be made in the final EIS concerning the project's effect on groundwater recharge of the underlying aquifers. Personnel from the Groundwater Section, Division of Resource Planning, DNER, have expressed an interest in this issue and are available for discussion with SCS staff.

